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CALIFORNIA GEOLOGICAL SURVEY PLACES SEISMIC MONITORS AT A CRUCIAL JUNCTION ON HAYWARD FAULT

HAYWARD -- When it comes to future large earthquakes in California, the Hayward Fault is a prime suspect. So the California Geological Survey's Strong Motion Instrumentation Program (SMIP) is beefing up its network of monitors near the fault to collect data that can enhance public safety during future quakes. SMIP currently is working at the busy junction of Highways 580 and 238, which straddles the fault.

"The scientific community believes that the next large earthquake in the state will occur either along the Hayward Fault or the Indio segment of the San Andreas Fault," said Dr. John Parrish, State Geologist of California and head of the California Geological Survey. "For the last couple of years, our aim has been to improve our coverage along the Hayward Fault and get instruments installed in the most appropriate locations. The data we gather can help make structures and buildings better able to withstand damaging earthquakes, which are infrequent but inevitable in California."

The SMIP monitors – known as "accelerographs" -- are not an early warning system. Instead, they measure the vertical and horizontal response of buildings, structures and soils. When activated by earthquake shaking, the devices produce a digital record from which the critical characteristics of ground motion (acceleration, velocity, and displacement) can be calculated. The information is provided to seismologists, engineers, building officials, local governments, and emergency response personnel throughout the state.

"Over the years, these instruments have produced a great deal of information beneficial to the scientific and engineering communities," said Dr. Anthony Shakal, head of SMIP. "California's seismic codes and construction practices are perhaps the most effective in the world in guiding structural design to minimize critical infrastructure damage in the event of a large earthquake."

Shakal called the work in Hayward, "quite an unusual setup" because of the underlying geology. While the Hayward Fault creeps slowly – about four-tenths of an inch a year – it does so relentlessly. Thus,

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the east side of the fault is underlain by solid sandstone while the west side has soil down at least 300 feet. The west side of the fault is moving northwest relative to the east.

"The material on either side of the fault is not related," Shakal said. "The soil on the west side was in a different county a thousand years ago, and a thousand years from now, it will be again. Because of the deep soil, we would anticipate a greater variety of movement on the west side, and the amplification of seismic waves will be greater there.

"What we've seen consistently in readings from vertical arrays like this is that the amplitude of shaking greatly increases as you get nearer the surface, particular in soil. If you could excavate 200 feet down and do your construction there, you probably wouldn't get much movement. Not a practical solution, though."

SMIP will place its instruments at ground level and in Caltrans-drilled boreholes 30, 100 and 300 feet deep to the east of the fault. To the west, instruments will be installed at ground level and 15, 30, 60, 100 and 300 feet deep. The instruments are 1,000 to 1,500 feet from the fault on either side on the Caltrans right-of-way. SMIP also will add 18 instruments to the six it has on the 580 overpass as Caltrans' schedule allows.

"We're grateful that Caltrans is working with us to place these instruments," Shakal said. "We share a concern for studying the effects of strong shaking on structures that are either in the near zone of faults or that cross faults. Caltrans recommended this site as a good place to collect this important data."

The California Geological Survey established SMIP in 1971 after the damaging San Fernando earthquake. SMIP has installed and maintains more than 5,000 recording instruments at more than 1,100 locations statewide, including city halls of San Francisco and Oakland and every major bridge in the Bay Area. Among other ongoing projects, SMIP is installing instruments on the tower of the new Bay Bridge.

The goal of SMIP and its partners in the California Integrated Seismic Network (CISN) – the California Institute of Technology, UC Berkeley, and the U.S. Geological Survey – is to have at least one instrument in every ZIP code in the state.

SMIP has placed 150 instruments along the Hayward Fault in the last few years. The program plans to instrument another 10 locations along the fault in the coming months, including fire stations in Alamo, San Ramon, El Cerrito and Moraga. The new Sutter Medical Center in Castro Valley, scheduled to open in 2012, also will be fitted with SMIP instruments. Currently, SMIP also is placing instruments on the tower of the new Bay Bridge and a highway interchange in Palmdale.

A report released in 2008 stated that there's a 31 percent chance the Hayward Fault will produce a magnitude 6.7 or greater earthquake in the next three decades. The fault generated a quake estimated at magnitude 7 in 1868. Historically, damaging earthquakes occur along the fault about every 140 years.

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